RESEARCH DEPARTMENT

U.H.F. TRANSMITTING AERIAL FOR THE EMLEY MOOR TELEVISION STATION

Technological Report No. E-119/2
UDC 621.396.712 1966/47

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for Head of Research Department

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INTRODUCTION

A u.h.f. transmitting aerial for the South Yorkshire area has been built on the support column of the new 386 m (1265 ft) ITA mast at Emley Moor. The aerial came into operation with trade transmissions on 18th June 1966 and started full service on 9th July 1966. It replaces a temporary aerial mounted at 102 m (335 ft) a.g.l. on the original tower.

SUMMARY OF INSTALLATION

Site: The site is 8·8 km (5½ miles) east-south-east of Huddersfield, grid reference SE/223 130, height 259 m (850 ft) a.m.s.l.

Support Structure: The support structure is a 386 m (1265 ft) stayed mast. Up to a height of 274 m (900 ft) the mast is cylindrical with a diameter of 2·74 m (9 ft) and this section is equipped with a lift. Between 274 m (900 ft) and 335 m (1100 ft) the cross-section is triangular with a side of 1·98 m (6 ft 6 in.). Above 335 m (1100 ft) the cross-section is triangular with a side of 1·30 m (4 ft 3 in.). The mast stays, which are attached to the faces of the triangular sections, are on bearings of 112°, 232° and 352° ETN.

General Arrangement: See Fig. 1.

Channels: The aerial is designed to radiate on the two BBC channels, 44 and 51, of which the latter is used for the opening service (BBC-2). Channel 51 has negative offset and Channel 44 will have zero offset.

Aerial: The aerial comprises eight tiers, each of six 5λ panels, giving a total radiating length of 39·4λ at Channel 44 and 42·7λ at Channel 51. The panels on each tier are mounted in pairs on the faces of the support mast and are fed with co-phased currents. The panels on face AB (bearing 232° ETN) are fed with a current amplitude of 0·6 relative to the currents in the panels on faces BC and CA. The aerial is protected from the weather by a 2·74 m (9 ft) diameter glass-fibre cylinder. Fig. 2 shows the arrangement of the panels on the mast and Fig. 3 shows the construction of each panel.

The mean height of the aerial is 370 m (1215 ft) a.g.l.

Feeders: The arrangement of the distribution feeder is shown schematically in Fig. 4. Each half of the aerial is connected to the transmitter by a feeder type F and G 6.1/8 - 50.

Power: Two 25 kW vision transmitters and two 5 kW sound transmitters will be provided for each channel; at present only those for Channel 51, have been installed. Each pair of transmitters will be run at the power required to give the maximum effective radiated power (e.r.p.) permitted under the Stockholm Agreement, namely 1000 kW.

Each vision transmitter is combined with a sound transmitter and the combined outputs are paralleled by means of a diplexer followed by a splitter transformer. This arrangement is employed so that small differences between the modulation characteristics of the vision transmitters

cannot cause distortion of the received signal. A two-channel combining unit will be added later, as required.

Templet and horizontal radiation pattern (h.r.p.):

The h.r.p. was specified to be directional in order to avoid waste of power to the west, where the service is limited by the terrain. The h.r.p.s at the vision carrier frequency of each operating channel, which are shown in Figs. 5 and 6 together with the h.r.p. templet, are the averages of measurements on each half of the full-scale aerial.

Vertical radiation pattern (v.r.p.):

The v.r.p. was specified to be gapfilled with the maximum of radiation tilted 0·9° below the horizontal; this is achieved by means of a phase distribution of the feed currents over the length of the aerial. The v.r.p.s obtained for each face, shown in Figs. 7-9, were computed from measurements of the amplitudes and phases of the feeds to the aerial panels, taken after erection.

Gain:

Channel		44			51
		dB			dB
Mean intrinsic gain		15·9			15·8
Deduct aerial losses:					
	dB			dB	
Gapfilling	1·4			2·0	
Distribution feeder	0·2			0·2	
Distribution transformers	0·1	1·7		0·1	2·3
Mean net gain		14·2			13·5
Deduct other losses:					
Main feeder, 387 m (1270 ft) F and G 6.1/8 - 50	2·4			2·5	
Feeder ground run 12·2 m (40 ft) rigid copper	0·2			0·2	
Diplexer	0·1			0·1	
Splitting transformer	0·1	2·8		0·1	2·9
Mean effective gain		11·4			10·6
H.R.P. maximum/mean ratio		2·6			3·9
Maximum effective gain		14·0			14·5

Programme feed: G.P.O. link

ACKNOWLEDGEMENTS

The mechanical and electrical design, construction and setting to work of the aerial were carried out by E.M.I. Electronics Ltd. The contracting authority was the BBC Transmitter Planning and Installation Department.

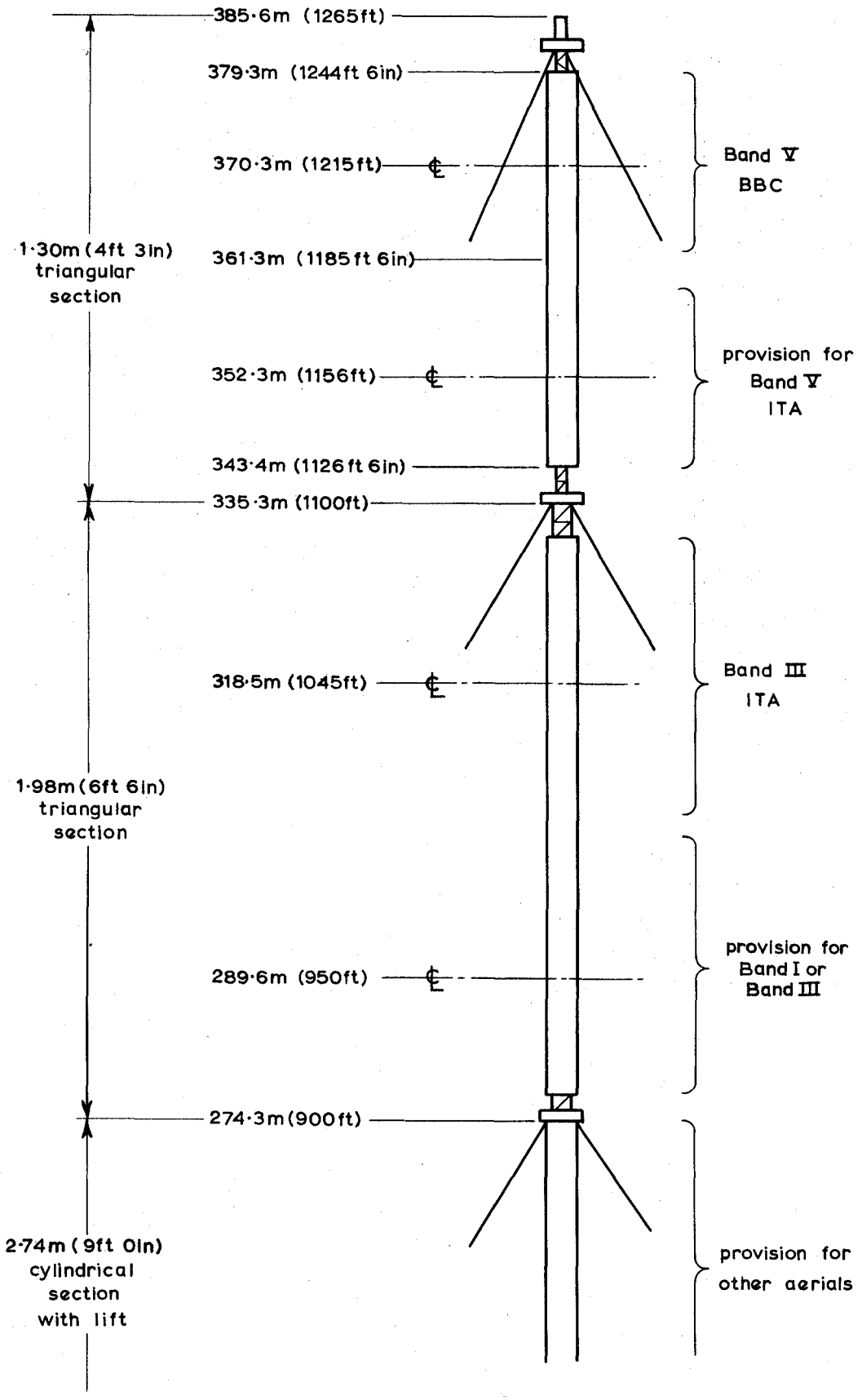

Fig. 1. General arrangement of aerials on mast

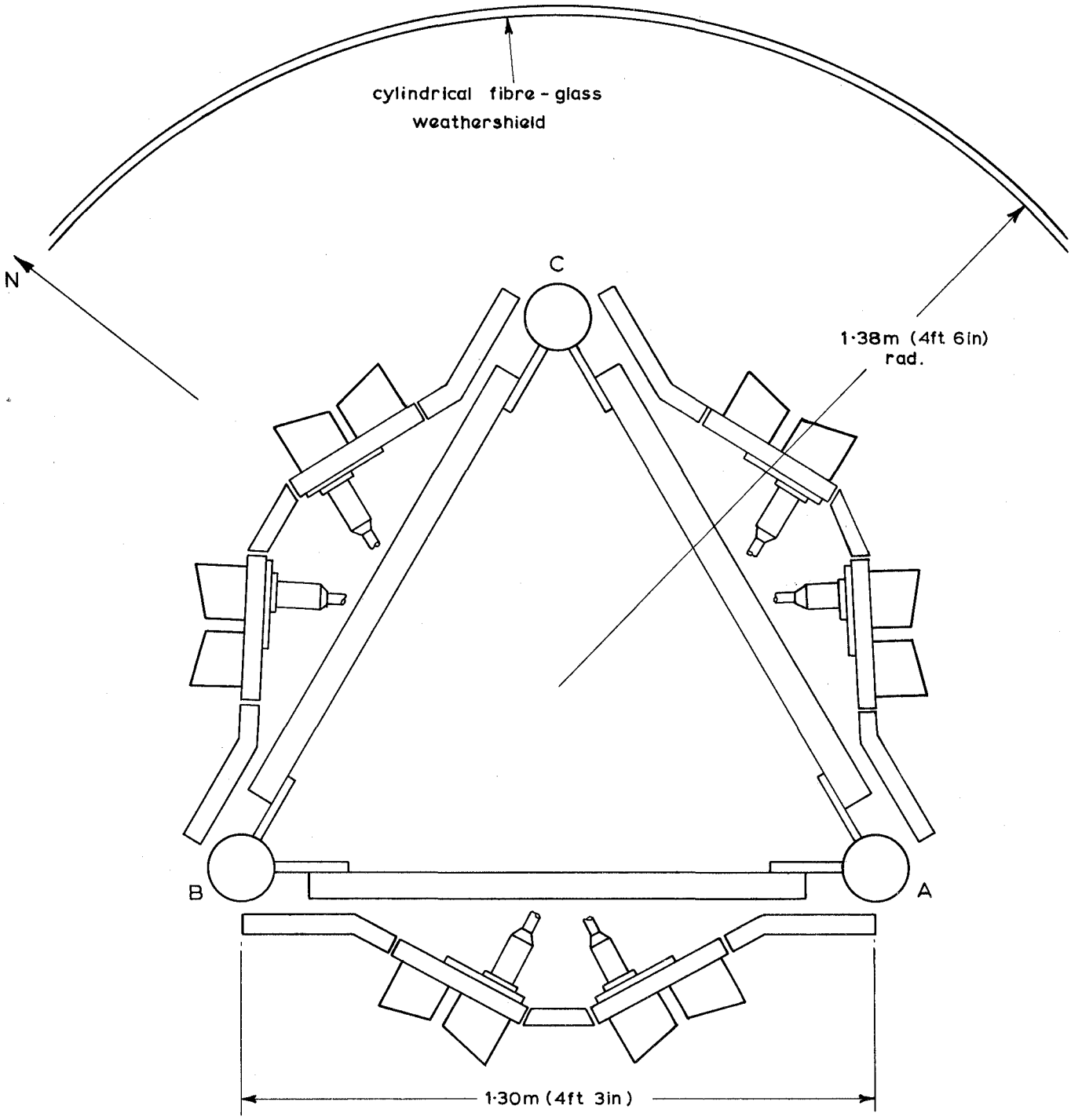

Fig. 2. Arrangement of U.H.F. aerial on the support mast.

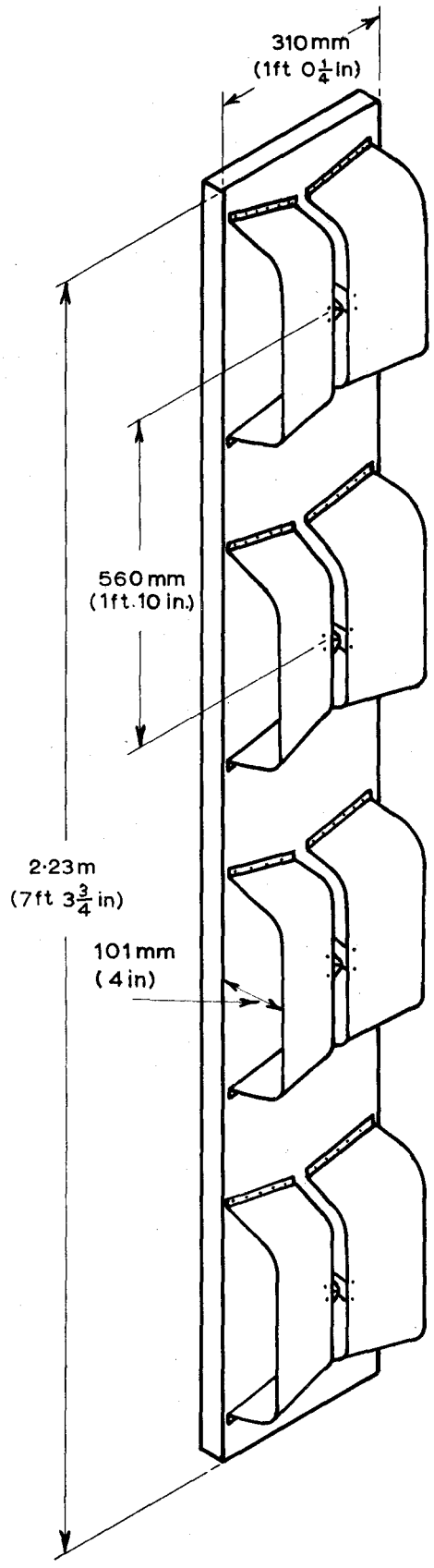

Fig. 3. Construction of aerial panel

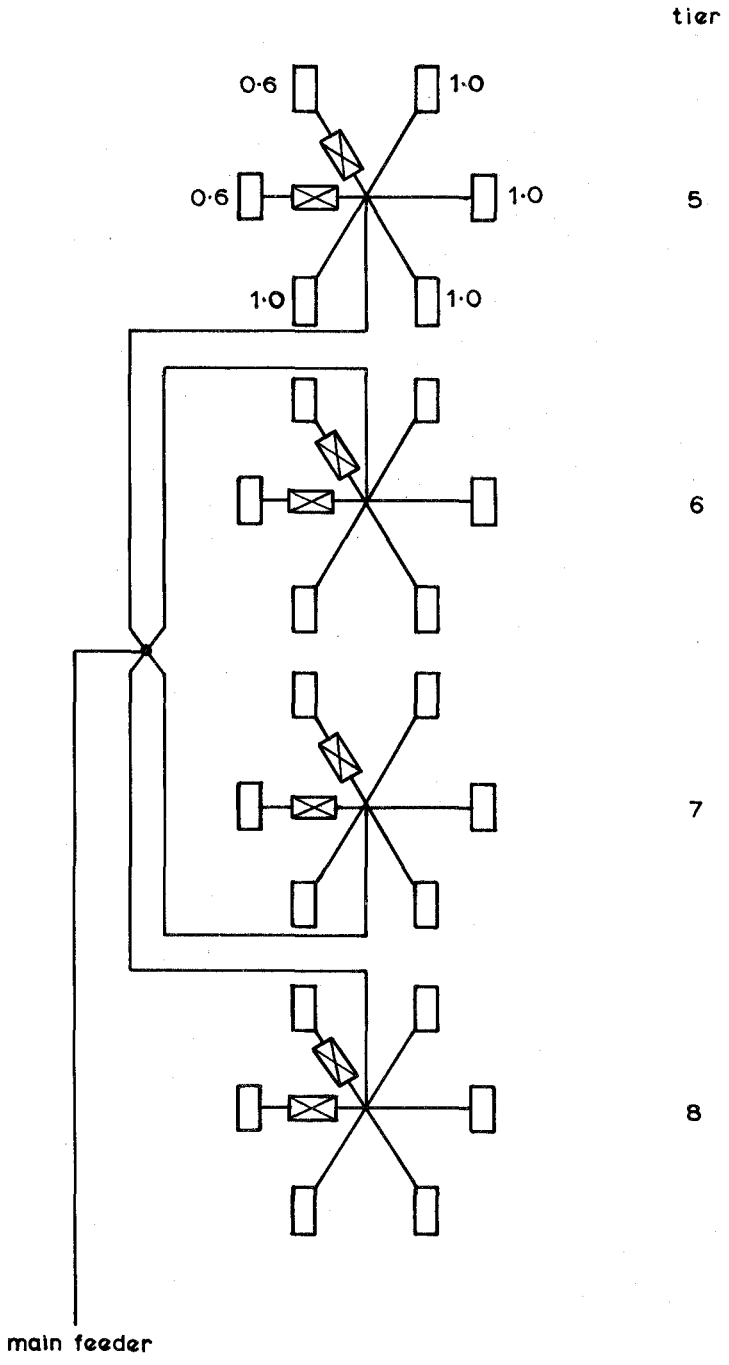

Fig 4. Schematic arrangement of distribution feeder (lower half aerial)

aerial panel with relative current shown

transformer

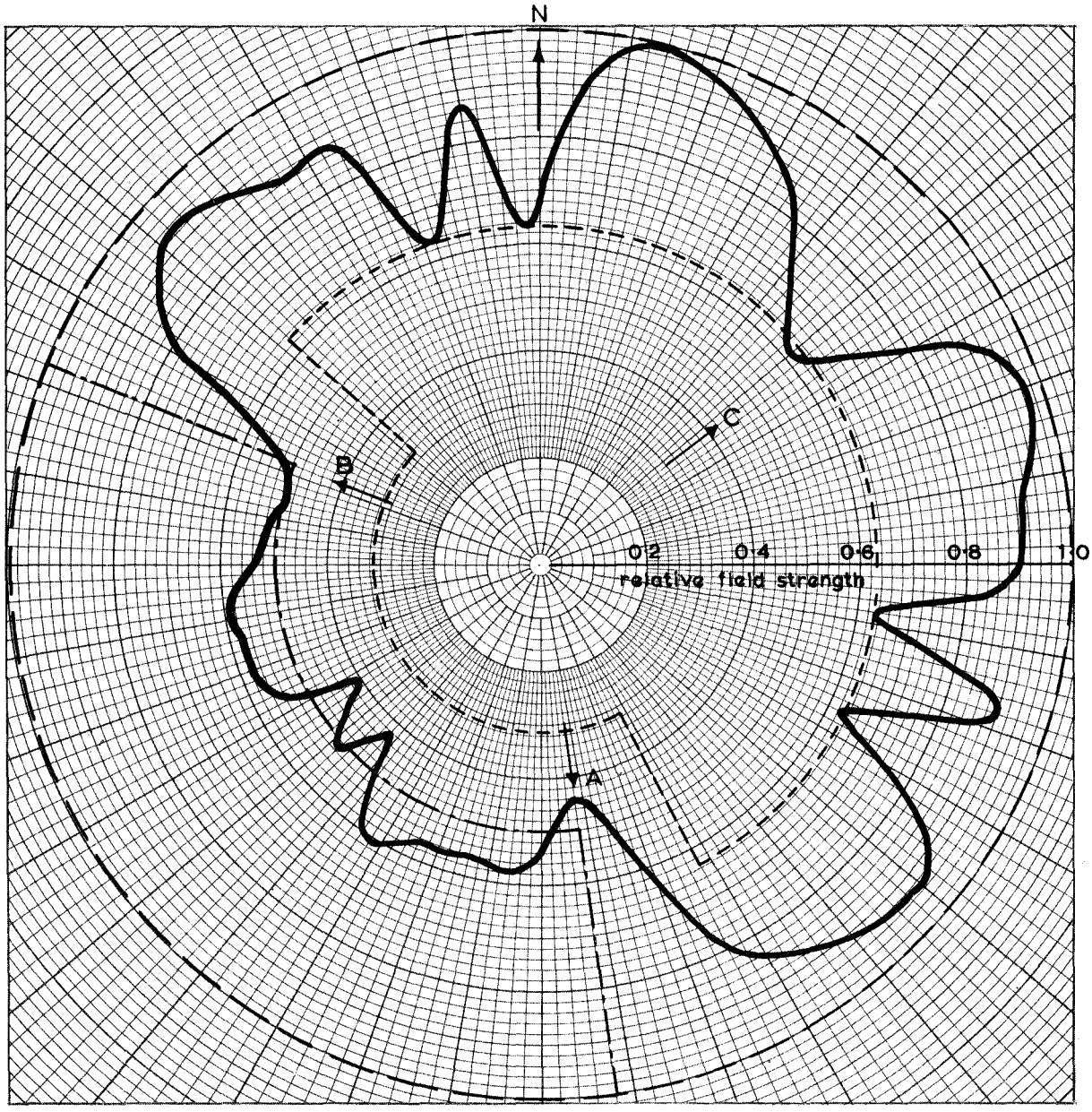

Fig. 5 Horizontal radiation pattern: Channel 44

HORIZONTAL POLARIZATION

Vision carrier 655·25 MHz, Sound carrier 661·25 MHz

Mean effective gain: 11·4dB

Peak vision transmitter power: 2×20kW

Mean E.R.P.: 545kW

—— Stockholm E.R.P. limit

—·— Additional desired E.R.P. limit

------ Minimum desired field

Unit field corresponds to an E.R.P. of 1000kW

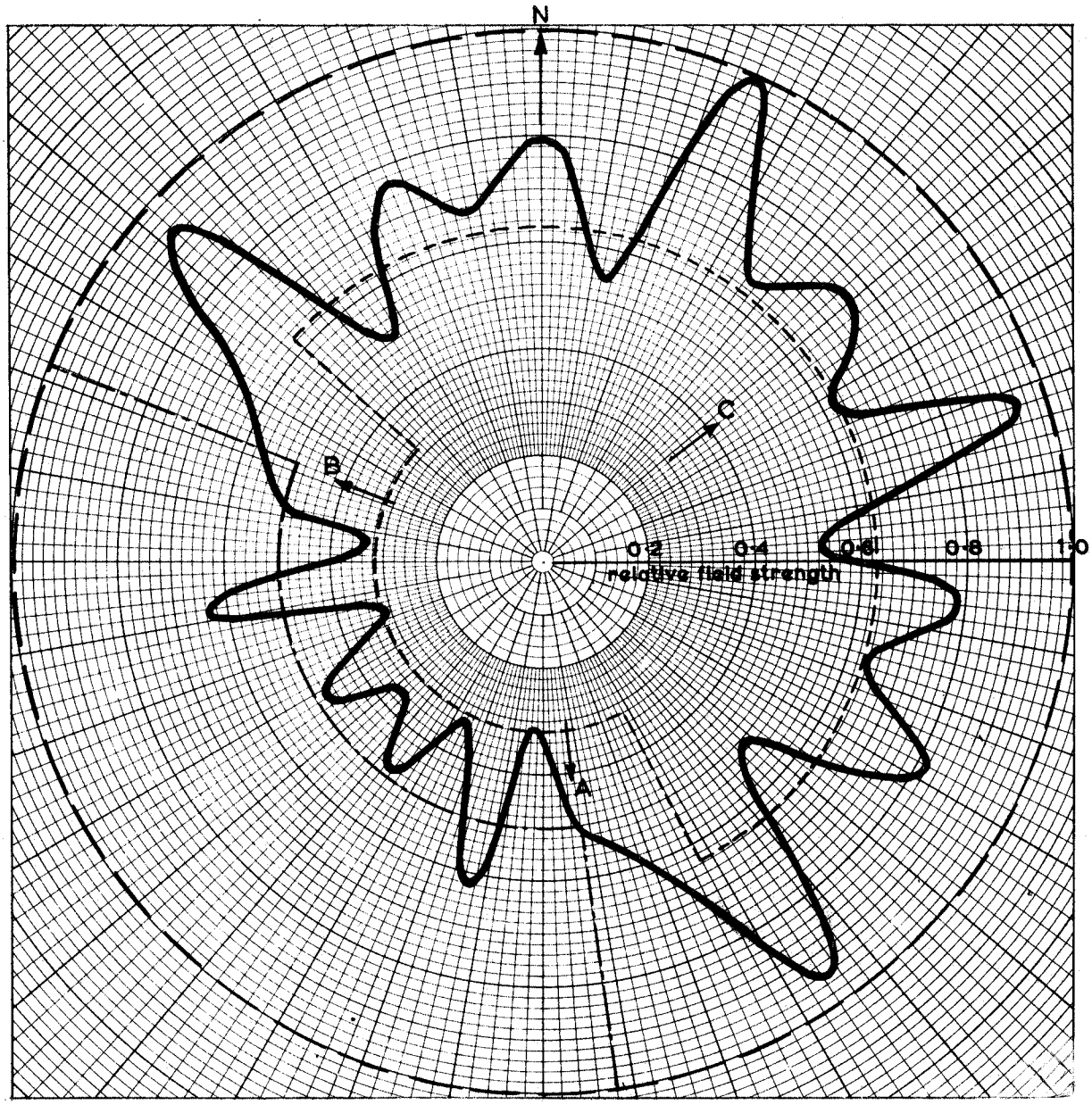

Fig.6 Horizontal radiation pattern: Channel 51

HORIZONTAL POLARIZATION

Vision carrier 711·25MHz, Sound carrier 717·25MHz

Mean effective gain: 10·6dB —— ——Stockholm E.R.P. limit

Peak vision transmitter power: 2×18kW —·—·—Additional desired E.R.P. limit

Mean E.R.P. 405kW ------Minimum desired field

Unit field corresponds to an E.R.P. of 1000kW

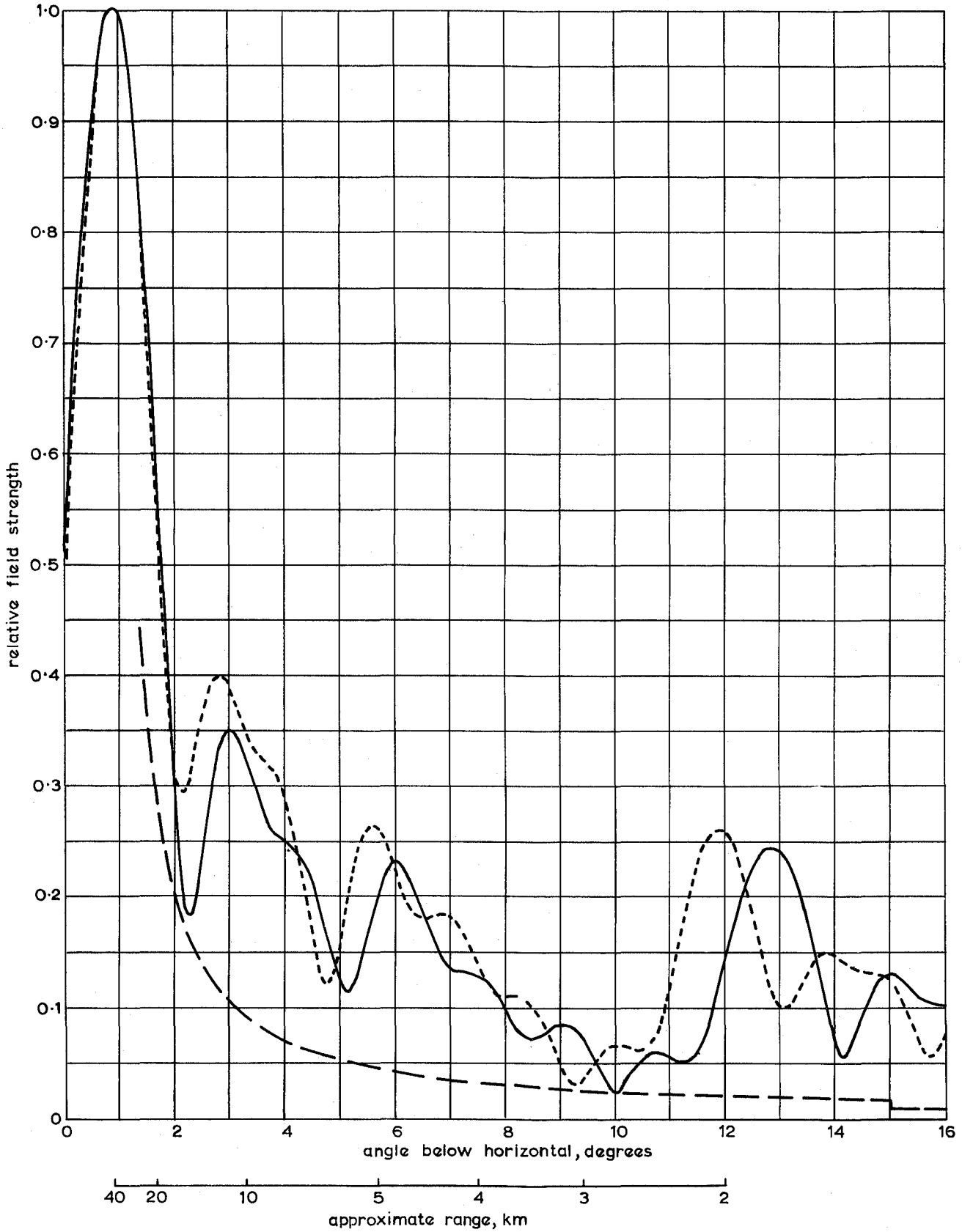

Fig.7 Vertical radiation pattern on bearing 112° E.T.N. (side CA)

——— Channel 44

---------- Channel 51

— — — Specified minimum field

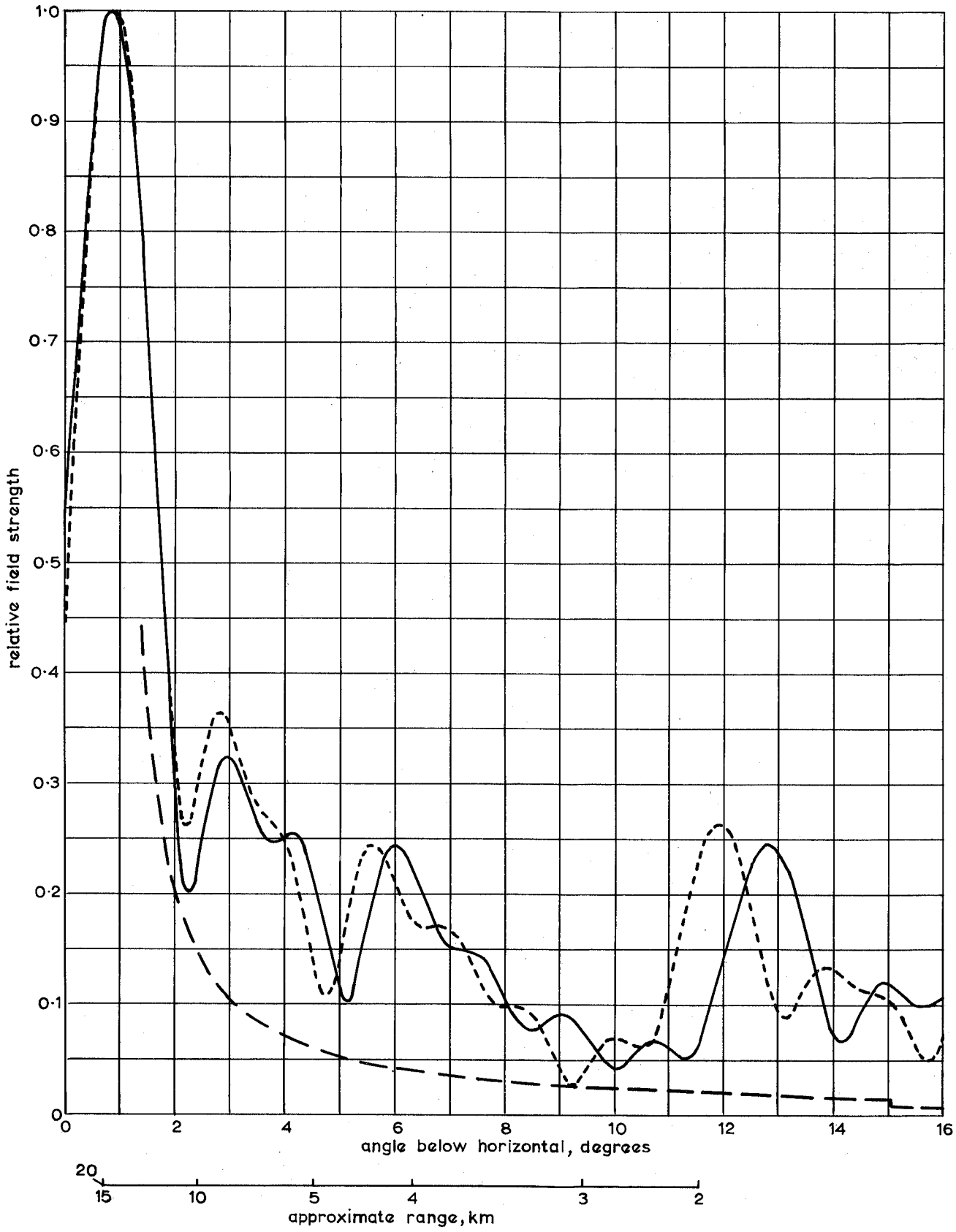

Fig. 8 Vertical radiation pattern on bearing 232° E.T.N. (side AB)

——— Channel 44
---------- Channel 51
— — — — Specified minimum field

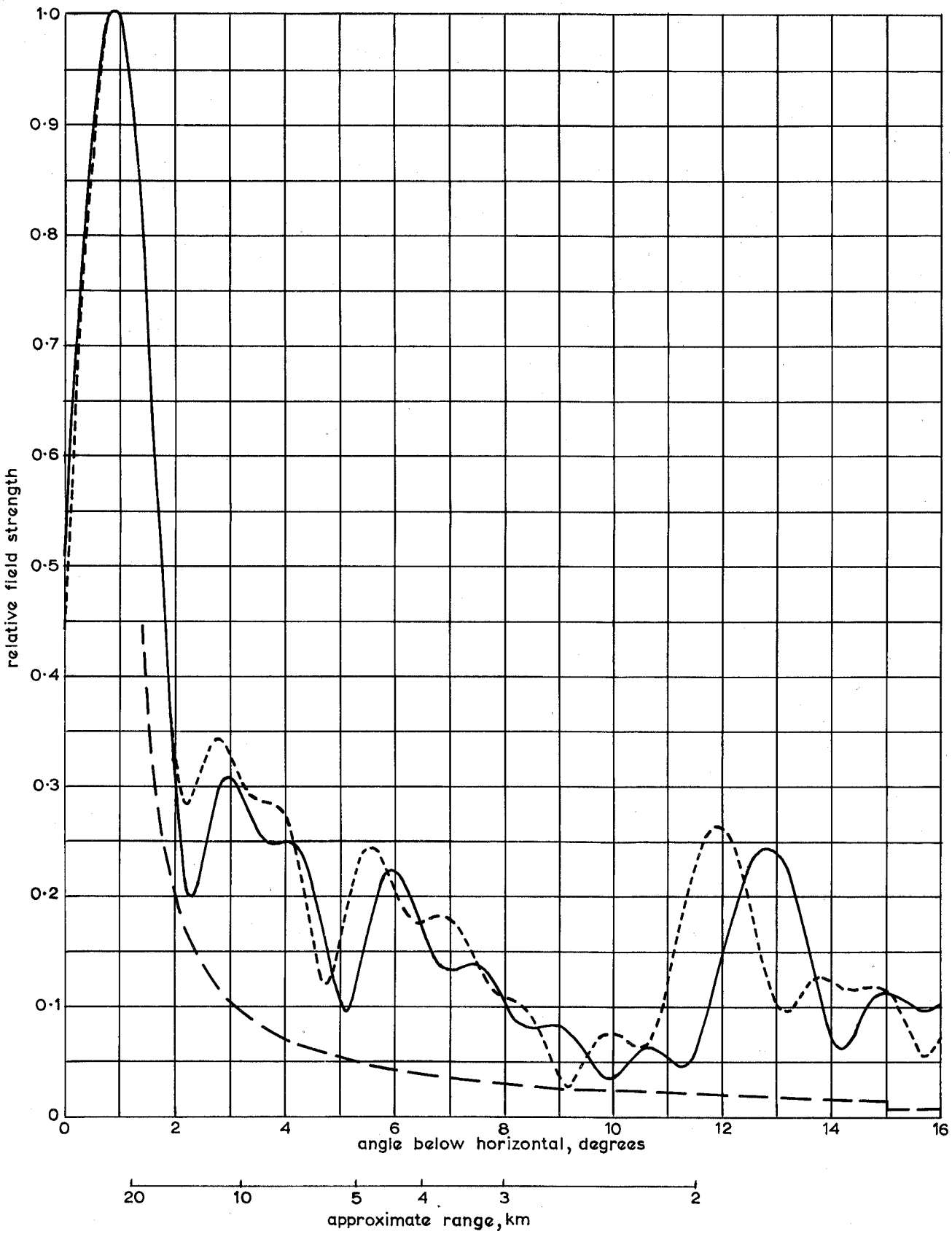

Fig.9 Vertical radiation pattern on bearing 352° E.T.N. (side BC)

——— Channel 44

- - - - - - - - - - Channel 51

— — — — Specified minimum field

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